# Summary

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Each year, the U.S. Department of Energy (DOE) publishes this integrated environmental report about the Hanford Site to summarize environmental data and information, describe environmental management performance, demonstrate the status of compliance with environmental regulations, and highlight major environmental programs and efforts. Individual sections of the report are designed to:

- Describe the Hanford Site and its mission.
- Summarize the status of compliance with environmental regulations.
- Describe the environmental programs at the Hanford Site.
- Discuss the estimated radiation exposure to the public from 2002 Hanford Site activities.
- Present effluent monitoring, environmental surveillance, and groundwater protection and monitoring information.
- Discuss activities to assure quality.

DOE's current mission at the Hanford Site includes cleaning up and shrinking the size of the site. It is the policy of DOE that all activities be carried out to comply with applicable federal, state, and local laws and regulations, DOE Orders, Secretary of Energy Notices, and directives, policies, and guidelines from DOE Headquarters and site operations.

## Compliance with Environmental Regulations in 2002

The site's compliance with federal acts in 2002 is summarized in Table S.1. For a detailed discussion of the site's compliance with environmental regulations during 2002, refer to Chapter 2 of this report.

A key element in Hanford's compliance program is the Tri-Party Agreement. The Tri-Party Agreement is an agreement among the Washington State Department of Ecology, U.S. Environmental Protection Agency (EPA), and DOE to achieve compliance with the remedial action provisions of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) and with treatment, storage, and disposal unit regulation and corrective action provisions of the *Resource Conservation and Recovery Act* (RCRA). During 2002, there were 40 specific cleanup milestones scheduled for completion: 36 were completed on or before their required due dates, 2 were completed beyond their established due dates, and 2 are yet to be completed.

Cleanup activities on the Hanford Site generate radioactive, mixed, and hazardous waste (Section 2.5). Mixed waste has both radioactive and hazardous non-radioactive substances. Hazardous waste contains either dangerous waste or extremely hazardous waste or both. This waste is handled and prepared for safe storage on the site or shipped to offsite facilities for treatment and disposal. In 2002, cleanup activities generated 1 million kilograms (2.2 million pounds) of solid mixed waste and 1.6 million kilograms (3.5 million pounds) of radioactive waste on the Hanford Site. There were 111,655 kilograms (246,199 pounds) of mixed waste and 1.5 million kilograms (3.3 million pounds) of radioactive waste received at Hanford from offsite. During 2002, a total of 132,583 kilograms (292,346 pounds) of hazardous waste was shipped off the Hanford Site. Liquid waste also was generated on the Hanford Site (Table 2.5.5). During 2002, there were 9.3 million liters (2.5 million gallons) of waste added to the double-shell tanks; the total volume of liquid waste in the double-shell tanks at the end of 2002 was 87.7 million liters (23.1 million gallons).

In addition to newly generated waste, significant quantities of legacy waste remain from years of nuclear material production and waste management activities. Most legacy waste from past operations at the Hanford Site resides in RCRA-compliant waste sites or is stored in several places awaiting cleanup and ultimate safe storage or disposal.

**Table S.1. Compliance with Federal Acts at the Hanford Site in 2002**

| Regulation | What it Covers | 2002 Status |
|---|---|---|
| Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) | Sites already contaminated by hazardous materials. | Work on these sites followed CERCLA requirements and met the schedules established by the Tri-Party Agreement. |
| Emergency Planning and Community Right-to-Know Act | The public's right to information about hazardous chemicals in the community and establishes emergency planning procedures. | The Hanford Site met the reporting requirements contained in this act. |
| Resource Conservation and Recovery Act (RCRA) | Hazardous waste being generated, transported, stored, treated, or disposed. The act primarily covers ongoing waste management at active facilities. | The Washington State Department of Ecology identified two non-compliance issues during 2002. One non-compliance issue was the leak detection system used with the temporary transfer lines at the single-shell tank farms. The other concerns were at the 600 Area Purgewater, Storage, and Treatment Facility; however, the letter citing this concern was rescinded. |
| Clean Air Act | Air quality, including emissions from facilities and diffuse and unmonitored sources. | According to the Washington State Department of Health, air emissions from Hanford Site facilities were well below state and federal standards. However, the Washington State Department of Health issued one non-compliance order regarding notification requirements in 2002. Corrective efforts were completed. |
| Clean Water Act | Discharges to U.S. waters. | The Hanford Site had two National Pollutant Discharge Elimination System Permits and seven State Wastewater Discharge Permits in 2002. |
| Safe Drinking Water Act | Drinking water supplies operated by DOE. | There were nine public water systems on the Hanford Site in 2002. The systems were monitored and all analytical results for 2002 met the requirements of the Washington State Department of Health. |
| Toxic Substances Control Act | Primarily chemicals called polychlorinated biphenyls. | Five hundred ninety-three drums of depleted uranium in oil containing polychlorinated biphenyl were moved from the 300 Area to the Environmental Restoration Disposal Facility staging area where they will remain pending treatment and disposal. |
| Federal Insecticide, Fungicide, and Rodenticide Act | Storage and use of pesticides. | At the Hanford Site, pesticides are applied by licensed commercial pesticide operators. |
| Endangered Species Act of 1973 | Rare species of plants and animals. | Hanford activities followed the requirements of this act. The Hanford Site has eleven plant species, two fish species, and six bird species on the federal or state lists of threatened or endangered species. |
| American Indian Religious Freedom Act, Antiquities Act, Archaeological and Historic Preservation Act, Archaeological Resources Protection Act of 1979, Historic Sites Buildings and Antiquities Act, National Historic Preservation Act, and Native American Graves Protection and Repatriation Act | Cultural resources. | One hundred sixty-four cultural resource reviews were conducted on the Hanford Site. |
| National Environmental Policy Act | Environmental impact statements for federal projects. | Environmental impact statements and environmental assessments were prepared or conducted as needed. In 2002, there were 20 site-wide categorical exclusions. |
| Migratory Bird Treaty Act | Migratory birds or their feathers, eggs, or nests. | Hanford activities used the ecological review process as needed to minimize any adverse effects to migratory birds. There are over 100 species of birds that occur on the Hanford Site that are protected by this act. |

Examples include high-level radioactive waste stored in single- and double-shell tanks and transuranic waste stored in vaults and on storage pads (see Section 2.5 for details).

## Environmental Occurrences

Environmental releases of radioactive and regulated materials from the Hanford Site are reported to DOE and other federal and state agencies as required by law. The specific agencies notified depend on the type, amount, and location of the individual occurrence. The Hanford Site Occurrence Notification Center maintains both a computer database and a hardcopy file of event descriptions and corrective actions.

During 2002, there were no environmentally significant emergency occurrence reports or environmentally significant unusual occurrence reports filed. Two off-normal occurrences with environmental impact are discussed in Section 2.4.3. One was the spread of contamination after a period of high winds on January 21, 2002; additional soil fixatives are now being used at excavation sites. The second event was a spill of radioactive liquid at the TX Tank Farm. The liquid spilled from a water lance when it was removed from a tank. To prevent similar occurrences in the future, the O-ring materials will be changed, and the joint will be welded.

## Environmental Monitoring

Environmental monitoring at the Hanford Site includes near-facility environmental monitoring, surface environmental surveillance, groundwater monitoring, and vadose zone monitoring. Near-facility monitoring includes the analysis of environmental samples collected near major nuclear-related installations, waste storage and disposal units, and remediation sites. Surface environmental surveillance consists of sampling and analyzing various media on and around the site (including the Columbia River) to detect potential contaminants and to assess their significance to environmental and human health. Groundwater sampling is conducted on the site to determine the distribution of radiological and chemical constituents in groundwater. The strategy for managing and protecting groundwater resources at the Hanford Site focuses on protection of the Columbia River, human health, the environment, treatment of groundwater contamination, and limitation of groundwater migration (Chapter 6). Vadose monitoring was conducted to better understand and alleviate the spread of subsurface contamination (Chapter 7).

The overall objectives of these monitoring and surveillance programs are to demonstrate compliance with applicable federal, state, and local regulations; confirm adherence to DOE environmental protection policies; and support environmental management decisions.

Environmental monitoring and surveillance results for 2002 are summarized in Table S.2. For detailed discussions of results, refer to the appropriate sections of this report.

## Facility Effluent Monitoring

Liquid and airborne effluent that may contain radioactive or hazardous constituents is continually monitored when released to the environment at the Hanford Site. Facility operators perform the monitoring mainly through analyzing samples collected at points of release into the environment. Effluent monitoring data are evaluated to determine the degree of regulatory compliance for each facility and/or the entire site. The evaluations are also useful to assess the effectiveness of effluent treatment and pollution-management practices.

In 2002, only facilities in the 200 Areas discharged radioactive liquid effluent to the ground, which went to the State-Approved Land Disposal Site (Section 3.1.3). Radioactive air emissions usually come from a building stack or vent. Radioactive emission discharge points are located in the 100, 200, 300, 400, and 600 Areas. Table 3.1.1 of this document provides a summary of radionuclides discharged to the atmosphere at the Hanford Site in 2002. Non-radioactive air pollutants from such things as diesel-powered electrical generating plants were monitored. Table 3.1.2 summarizes the non-radioactive discharges to the air on the Hanford Site during 2002.

## Table S.2. Hanford Site Monitoring Results for 2002

| | What was Monitored? | The Bottom Line |
|---|---|---|
| Air | Air sampling equipment collected particles and gases, which were analyzed for radioactive materials. Air was sampled at 24 locations on Hanford, at 11 perimeter locations, in 8 nearby communities, and in 2 distant communities. In addition, near-facility monitoring collected air samples at 82 locations near Hanford facilities. | All measurements of radioactive materials in air were below recommended guidelines. |
| Columbia River Water | Columbia River water was collected from multiple sampling points throughout the year. Water samples were analyzed for radioactive and chemical materials. Water in the Columbia River continues to be designated Class A (Excellent) by the state of Washington. This designation means that the water is usable for substantially all needs. | As in past years, small amounts of radioactive materials were detected downriver from Hanford. However, the amounts were far below federal and state limits. During 2002, there was no indication of any deterioration of Columbia River water quality resulting from operations at Hanford. |
| Columbia River Shoreline Springs | Groundwater discharges to the Columbia River via surface and subsurface locations. Discharges above the water level of the river are identified as riverbank springs. Samples of spring water were collected at locations along the Columbia River shoreline. | Samples collected at the springs contained some contaminants at levels above drinking water standards. However, concentrations in river water downstream of the shoreline springs remained far below federal and state limits. |
| Groundwater | Groundwater samples were collected from 658 wells to monitor contaminant concentrations. Water levels were measured in several hundred wells on the site to map groundwater movement. | Samples show that groundwater contaminant plumes are moving slowly from beneath former waste sites toward the Columbia River. Contaminant concentrations are declining in the largest plumes because of spreading and radioactive decay. |
| Vadose Zone | The vadose zone is the region between the ground surface and the top of the water table. Vadose zone characterization and monitoring are conducted to better understand and alleviate the spread of subsurface contamination. | Vadose zone characterization was conducted at five operable units in the 200 Areas. Vadose zone monitoring occurred at the tank farms in the 200-East, and 200-West Areas. Tech-demonstrations are designed to result in new, innovative methods for environmental monitoring and cleanup on the Hanford Site. In 2002, thirteen technical studies were conducted. |
| Drinking Water | The quality of the drinking water supplied by nine DOE-owned systems on the Hanford Site was analyzed. | All DOE-owned drinking water systems on the Hanford Site met Washington State and EPA regulations. |
| Food and Farm Products | Samples of cherries, leafy vegetables, milk, potatoes, tomatoes, and wine were collected from 17 locations upwind and downwind of the Hanford Site. | Radionuclide levels in samples of food and farm products were at normal environmental levels. |
| Fish and Wildlife | Game animals on the site and along the Hanford Reach and fish from the Columbia River were monitored at thirteen locations. Carcass, bone, and muscle samples were analyzed to evaluate radionuclide levels. | Samples of carp, bass, California quail, and mule deer were collected and analyzed. Radionuclide levels in wildlife samples were well below levels that are estimated to cause adverse health effects to animals or to the people who may consume them. |
| Effluent Monitoring | Liquid effluent and airborne emissions that may contain radioactive or hazardous constituents are continually monitored on the Hanford Site. | Some quantities of radionuclides were released to the environment at state and federally permitted release points. Compliance with all applicable effluent monitoring requirements was achieved in 2002. |

# Waste Site Remediation

Full-scale remediation of waste sites began in the 100 Areas in 1996 and continued in 2002 at several liquid waste disposal sites in the 100-B/C and 100-F Areas (Section 2.3.12.2). Also, remediation of the treatment, storage, and disposal units at the 100-N Area continued and remediation began in the 100-K Area. From 1996 through 2001, 413,000 metric tons (455,000 tons) of contaminated soil were removed from the 100-H Area and shipped to the Environmental Restoration Disposal Facility. No soil was excavated during 2002 at the 100-H Area. In 2002, the following activities were completed:

- **100-B/C Area** – 137,000 metric tons (151,000 tons) of contaminated soil and 3,100 linear meters (11,800 linear feet) of pipeline were removed and shipped to the Environmental Restoration Disposal Facility in 2002; a total of 870,000 metric tons (957,000 tons) of soil and 5,200 linear meters (17,100 linear feet) of pipeline have been removed since startup.
- **100-F Area** – 279,000 metric tons (307,000 tons) of contaminated soil were removed and shipped to the Environmental Restoration Disposal Facility in 2002; a total of 749,000 metric tons (824,000 tons) has been removed since startup.
- **100-N Area** – 122,605 metric tons (134,731 tons) of contaminated soil were removed and shipped to the Environmental Restoration Disposal Facility in 2002; a total of 259,855 metric tons (285,853 tons) have been removed since startup.
- **100-K Area** – 4,842 metric tons (5,321 tons) of contaminated soil were removed and disposed at the Environmental Restoration Disposal Facility in 2002.

In 2002, a remedial design for the 100-B/C Area burial sites was issued for review. Decontamination and decommissioning activities continued in 2002 at the 100-D/DR, 100-H, and 100-F Areas. These activities were conducted to support the interim safe storage of the four reactor buildings for up to 75 years. The interim safe storage minimizes the potential risk to the environment, employees, and the public and reduces surveillance and maintenance costs. These activities are conducted as non-time-critical actions under CERCLA.

The environmental restoration contractor completed the final draft feasibility study for the Canyon Disposition Initiative in 2002. The purpose of this initiative is to investigate the potential for using the five canyon buildings at the Hanford Site as disposal facilities for remediation waste, rather than demolishing the structures. The U Plant was used as a pilot project.

Remediation work at the 300-FF-1 and 300-FF-2 Operable Units continued. Excavation of the 618-4 burial ground was completed and 510,000 metric tons (560,000 tons) of contaminated material and debris were taken to the Environmental Restoration Disposal Facility. Excavation of the 618-5 burial ground began in 2002 with the removal of 10,349 metric tons (11,373 tons) of contaminated soil, which was disposed at the Environmental Restoration Disposal Facility. Closure of the 618-4 and 618-5 burial grounds is scheduled for 2003.

During 2002, activities continued across the Hanford Site to clean up waste from past practices. The activities are guided by the Tri-Party Agreement, an agreement to achieve compliance with CERCLA remedial action provisions and with RCRA treatment, storage and disposal unit regulations and corrective action provisions. Many programs are an integral part of Hanford cleanup.

**Pollution Prevention Program**. This program (Section 2.3.1) focuses on conservation of resources and energy, reduction of hazardous substance use, and prevention or minimization of pollutant releases. In 2002, the efforts of the program reduced the quantity of disposed waste by recycling 142,908 cubic meters (5 million cubic feet) of radioactive and mixed waste, 737 metric tons (812 tons) of RCRA hazardous waste, and 3,936 metric tons (4,339 tons) of sanitary waste. The cost savings for waste disposal in 2002 exceeded $37 million for these activities. During 2002, the Hanford Site also recycled 547 metric tons (603 tons) of paper products and 559 metric tons (616 tons) of various metals.

**Spent Nuclear Fuel Project**. This project (Section 2.3.2) provides safe, economic, and environmentally sound management of Hanford spent nuclear fuel and prepares the fuel for long-term storage. In 2002, the project continued to make progress on an accelerated strategy to remove spent fuel from underwater storage in the K Basins and place it in dry interim storage in the 200-East Area. The spent fuel will be maintained in dry storage pending a decision by the Secretary of Energy on final disposition.

Major accomplishments of the Spent Nuclear Fuel Project during 2002 included the following items:

- A total of 730.5 metric tons (805 tons) of spent nuclear fuel were removed from the K-West Basin, transported to the Cold Vacuum Drying Facility for processing, and moved to the Canister Storage Building for storage.
- A total of 260 fuel canisters (or ~82 metric tons [~90 tons]) of spent nuclear fuel were transferred from the K-East Basin to the K-West Basin for cleaning and re-packaging before transport to the Cold Vacuum Drying Facility for processing.
- A total of 1,133 fuel storage canisters and 917 fuel storage canister lids were cleaned for disposal at the Environmental Restoration Disposal Facility. A total of 1,172 canisters were shipped to the Environmental Restoration Disposal Facility for disposal.
- Construction of the sludge removal system for the K-East Basin progressed to 95% completion.
- Three cask shipments containing non-defense spent nuclear fuel were received for storage at the 200 Areas Interim Storage Area near the Canister Storage Building facility.

**Central Plateau Remediation Project**. This project's mission (Section 2.3.3) is to transition the Central Plateau from its current post-operational state by deactivating and closing facilities in a safe and compliant manner until they can be turned over to the site contractor responsible for final disposition. The Central Plateau Remediation Project includes the Accelerated Deactivation Project, 324 and 327 Facilities Deactivation Project, Equipment Disposition Project, 233-S Plutonium Concentration Facility Decommissioning Project, 200 Area Facilities Disposition Project, and Canyon Disposition Project.

**Advanced Reactors Transition Project**. The mission of this project (Section 2.3.5) is to transition or convert the Plutonium Recycle Test Reactor facility, and facilities used for nuclear research, into structures that are in a safe and stable condition suitable for reuse or low cost surveillance and maintenance. The only facilities remaining to be cleaned up are in the southeastern part of the 300 Area, the high bay of the 337 Building, and the adjacent storage tank building, 3718M.

**Solid Waste Management**. Solid waste management at the Hanford Site included the treatment, storage, and disposal of solid waste at many Hanford locations (Section 2.3.9). The solid waste facilities include the Central Waste Complex, Waste Receiving and Processing Facility, Radioactive Mixed Waste Disposal Facility, and T Plant Complex. During 2002, 656 cubic meters (23,163 cubic feet) of low-level mixed waste were treated and/or directly disposed onsite. Eight packages containing defueled reactor compartments from the U.S. Navy were received and disposed of at the 200-East Area in 2002.

**Liquid Effluent Treatment**. Liquid effluent is managed in facilities that comply with RCRA and state regulations (Section 2.3.10). The 242-A evaporator completed one campaign during 2002 to concentrate dilute liquid tank waste and reduce its volume to eliminate the need to construct additional double-shell tanks. The volume of waste treated was ~3.9 million liters (~1 million gallons) and the waste volume reduction was ~1.6 million liters (413,500 gallons) or 41%.

Approximately 44 million liters (11.6 million gallons) of liquid waste were stored at the Liquid Effluent Retention Facility at the end of 2002, and 83.5 million liters (22 million gallons) of liquid waste were treated at the 200 Area Effluent Treatment Facility in 2002. The 200 Area Treated Effluent Disposal Facility received 863 million liters (227.9 million gallons) of unregulated effluent for disposal in 2002. The major source of this effluent is uncontaminated cooling water and steam condensate from the 242-A evaporator.

Industrial wastewater generated throughout the Hanford Site is collected and treated in the 300 Area Treated Effluent Disposal Facility. The wastewater consists of once-through cooling water, steam condensate, and other industrial wastewater (Section 2.3.10.5). The volume of industrial wastewater treated and disposed of during 2002 was 163.7 million liters (43.2 million gallons). The volume of wastewater monitored and released to the 300 Area Treated Effluent Disposal Facility for treatment and disposal from the 307 Retention Basins in 2002 was 5.5 million liters (1.5 million gallons).

**Revegetation and Mitigation Planning**. The DOE Richland Operations Office and U.S. Fish and Wildlife Service cooperatively worked on a plan to re-vegetate land on the Fitzner/Eberhardt Arid Lands Ecology Reserve to compensate for damage to the environment caused by the construction of cells 1 and 2 at the Environmental Restoration Disposal Facility. The Environmental Restoration

Disposal Facility mitigation project includes three separate planting elements: native grass seeding planting, shrub seedling planting, and native grass plug planting. Approximately 65 hectares (~160 acres) were planted with native grass seed, and 139,000 shrubs were planted across ~125 hectares (~310 acres) during 2002.

Monitoring of survival and growth continued for ~90,000 sagebrush seedlings that were planted on ~90 hectares (~222 acres) at nine locations on the Fitzner/Eberhardt Arid Lands Ecology Reserve Unit during December 2000. This effort was the last phase of sagebrush transplanting as compensatory mitigation for the disturbance of sagebrush habitat resulting from the development of the site and infrastructure for the planned waste vitrification facility. Monitoring of these plants will continue during 2004.

**Groundwater Protection Program**. The Groundwater Protection Program (Section 2.3.13) coordinates all projects at Hanford involved in characterizing, monitoring, and remediating groundwater and the vadose zone. The goal of groundwater remediation is to prevent contaminants from entering the Columbia River, reduce the contamination in areas of high concentration, prevent the movement of contamination, and protect human health and the environment. Table S.3 lists a summary of the activities in 2002. Figure S.1 shows the location of groundwater remediation systems.

**Office of River Protection**. The Office of River Protection manages DOE's River Protection Project, which is responsible for storage, retrieval, treatment, and disposal of high-level tank waste and closure of the tank farms on the Hanford Site (Section 2.3.8). The status of 177 waste tanks on the Hanford Site was reported in *Waste Tank Summary Report for Month Ending December 31, 2002*.

To date, 132 of the 149 (89%) single-shell tanks have been stabilized, and the stabilization program is on schedule to be completed by the end of September 2004. During 2002, three tanks (241-SX-105, 241-U-102, and 241-U-109) were declared stabilized. Waste was pumped

**Table S.3. Summary of Groundwater Pump-and-Treat Systems and a Soil-Vapor Extraction System**

| Location | Startup Date | Contaminant | Mass Removed (Groundwater Processed) in 2002 | Mass Removed (Groundwater Processed) Since Startup |
|---|---|---|---|---|
| **Groundwater Pump-and-Treat Systems** | | | | |
| 100-D Area | 1997 | Hexavalent chromium | 28.7 kilograms (166.4 million liters) | 130.6 kilograms (797.7 million liters) |
| 100-H Area | 1997 | Hexavalent chromium | 3.3 kilograms (184.1 million liters) | 30.45 kilograms (734.1 million liters) |
| 100-K Area | 1997 | Hexavalent chromium | 35.3 kilograms (445.7 million liters) | 184.1 kilograms (1.69 billion liters) |
| 100-N Area | 1995 | Strontium-90 | 0.20 curies (121.7 million liters) | 1.3 curies (788.2 million liters) |
| 200-West Area (200-ZP-1) Operable Unit | 1994 | Carbon tetrachloride | 965.8 kilograms (281 million liters) | 7,049 kilograms (1.95 billion liters) |
| 200-West Area (200-UP-1) Operable Unit | 1994 | Carbon tetrachloride | 2.7 kilograms (79.1 million liters) | 23,315 grams (633.6 million liters) |
| | 1994 | Nitrate | 3,665 kilograms (79.1 million liters) | 24,152 kilograms (633.6 million liters) |
| | 1994 | Technetium-99 | 14.9 grams (79.1 million liters) | 93.5 grams (633.6 million liters) |
| | 1994 | Uranium | 27.6 kilograms (79.1 million liters) | 164,340 grams (633.6 million liters) |
| **Soil-Vapor Extraction** | | | | |
| 200-West Area | 1992 | Carbon tetrachloride | 628 kilograms | 77,798 kilograms |

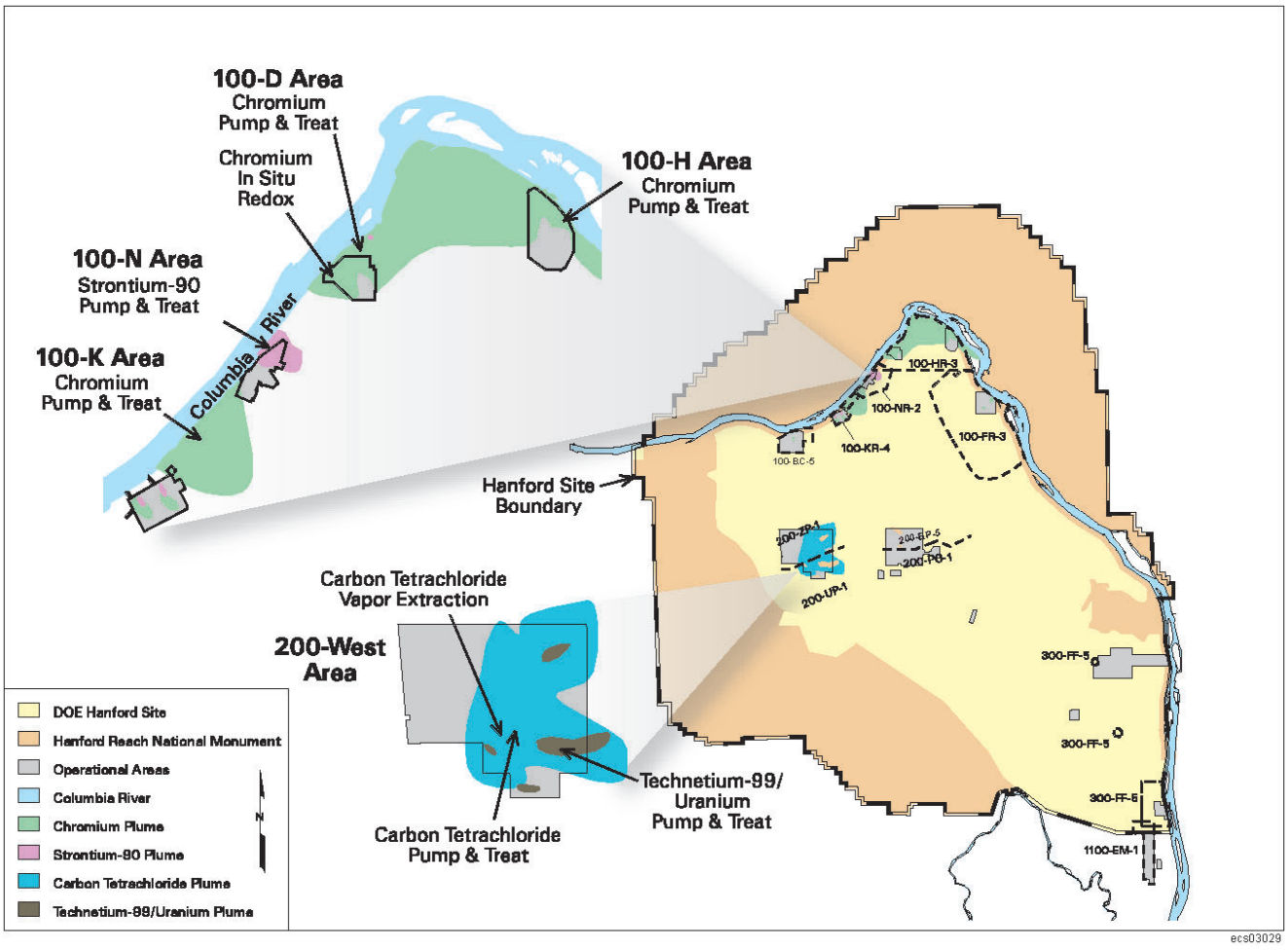


**Figure S.1. Hanford Site Pump-and-Treat and Soil-Vapor Extraction Systems**

from 17 single-shell tanks into the double-shell tank system. The pumping removed 5.3 million liters (1.4 million gallons) of waste.

To assure safe storage and retrieval, 154 of the 177 (87%) tanks have been characterized. All of the double-shell tanks and most of the single-shell tanks have been sampled; however, a number of these tanks were analyzed for a limited number of analytes.

During 2002, CH2M HILL Hanford Group, Inc. began proof-of-concept testing techniques to dissolve saltcake in waste tanks and evaluated three supplemental waste treatment technologies (containerized grout, steam reforming, and bulk vitrification), all intended for use on retrieved tank waste. CH2M HILL Hanford Group, Inc. also began evaluating a separate disposal path for mixed transuranic tank waste that would include onsite treatment and packaging for shipment to the DOE Waste Isolation Pilot Plant in New Mexico.

***Geophysical Logging***. Geophysical logging at the Hanford Site is performed using capabilities and experience established for the National Uranium Resource Evaluation Program. Until 2002, this work was performed by MACTEC-ERS. On July 21, 2002, vadose zone logging and monitoring activities were transferred from MACTEC-ERS to the S. M. Stoller Corporation. Under the new contract, S. M. Stoller Corporation is responsible for all geophysical logging at the Hanford Site. Logging activities are now integrated across multiple organizations and projects and consistent procedures and data quality objectives are in use. Plans and procedures are being updated to reflect the transition to the new contractor. In addition, responsibility for day-to-day program management was transferred from the DOE Grand Junction Office to the DOE Richland Operations Office. S. M. Stoller Corporation performs geophysical logging for both the DOE Richland Operations Office and DOE Office of River Protection. The primary goal of logging activities

performed for the DOE Richland Operations Office is characterization of waste sites on the Central Plateau. For the DOE Office of River Protection, the logging effort involves vadose zone monitoring around the single-shell tanks.

***Single-Shell Tank Monitoring***. Monitoring activities at the single-shell tank farms identified subsurface contaminant plumes. Cobalt-60, cesium-137, europium-152, europium 154, uranium-235, and uranium-238 were the predominant gamma-emitting contaminants. Minor amounts of tin-126 and antimony-125 were also detected. Since specific contaminants have been identified and quantified, the primary focus of the monitoring was to identify changes in contaminant levels.

During 2002, monitoring activities were performed in a total of 385 boreholes, representing ~6,706 meters (~22,000 feet) of logging. The high-priority boreholes in each tank farm were monitored at least once. In addition to routine activities, monitoring was also performed to support tank farm operations or to investigate potential anomalies. Monitoring of boreholes in the vicinity of tank U-107 was performed to support the planned tests for saltcake dissolution.

During 2002, the neutron moisture logging system was used to measure volumetric moisture content in the vadose zone around tank U-107. Experience with the neutron moisture log at Hanford has indicated that it is useful for identifying changes in soil moisture that may be related to ongoing contaminant migration and for delineating fine-grained beds for stratigraphic correlation.

***Waste Immobilization***. The Waste Treatment Plant is being built on 26 hectares (65 acres) located on the Central Plateau outside of the Hanford 200-East Area to treat radioactive and hazardous waste currently stored in 177 underground tanks. Currently, three major facilities are scheduled to be constructed: a pretreatment facility, a high-level waste vitrification facility, and a low-activity waste vitrification facility. Supporting facilities will be constructed also. The River Protection Project is currently upgrading tank farm facilities to deliver waste to the Waste Treatment Plant.

During 2002, the contractor began pouring concrete for the Pretreatment Plant, High-Level Waste Vitrification Plant, and the Low-Activity Waste Vitrification Plant. The potable water services and the sewage system for the plant began operating.

# Potential Radiological Doses from 2002 Hanford Operations

During 2002, potential radiological doses to the public and biota from Hanford operations were evaluated to determine compliance with pertinent regulations and limits (Chapter 5). These doses were calculated using reported effluent releases and environmental surveillance data using version 1.485 of the GENII computer code and Hanford-specific parameters. The potential dose to the maximally exposed individual in 2002 from site operations was 0.02 mrem (0.2 μSv). To put this value into perspective, the national average dose from background sources (Figure S.2), according to the National Council on Radiation Protection, is ~300 mrem/yr (3 mSv/yr), and the current DOE radiological dose limit for a member of the public is 100 mrem/yr (1 mSv/yr).

# Other Hanford Environmental Programs

## Climate and Meteorology

Meteorological measurements are taken to support Hanford Site emergency preparedness, site operations, and atmospheric dispersion calculations. Weather forecasting and maintenance and distribution of climatological data are provided. The data are provided by the Hanford Meteorology Station, which is located on the Central Plateau. A complete report of climatological data for calendar year 2002 is contained in *Hanford Site Climatological Data Summary 2002 with Historical Data*.

## Cultural Resources

Management of archaeological, historical, and traditional cultural resources at the Hanford Site complies with the requirements of various federal laws. During 2002, 164 cultural resource reviews were requested and conducted on the Hanford Site to comply with Section 106 of the *National Historic Preservation Act*.

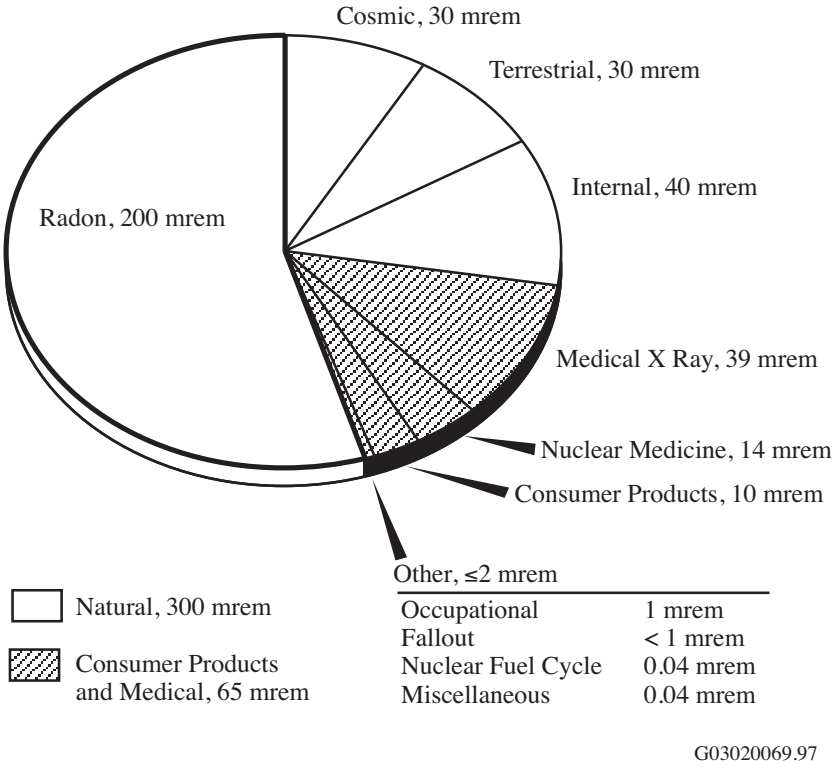


**Figure S.2. National Annual Average Radiological Doses from Various Sources (National Council on Radiation Protection and Measurements 1987)**

Monitoring conducted during 2002 focused on: Locke Island erosion, archaeological sites affected by visitors or nature, historic buildings, and Native American sites. A total of 66 archaeological sites, 5 buildings, and cemetery or burial locations were monitored during 2002.

Public involvement is an important component of cultural resource management. To accomplish this goal, DOE developed mechanisms that allow the public access to cultural resources information and the ability to comment and make recommendations concerning the management of cultural resources on the Hanford Site. During 2002, seven tribal meetings on cultural resources provided a venue for the exchange of information between DOE, tribal staff members, and site contractors about projects and work on the Hanford Site.

The final *Hanford Cultural Resources Management Plan* was approved in December 2002, and the *History of the Plutonium Production Facilities at the Hanford Site Historic District, 1943-1990* was published. During 2002, DOE also continued to document the oral histories of early residents of areas now part of the Hanford Site as well as Native Americans, former Hanford Site workers, and current site employees. A total of eight interviews were conducted during 2002.

## Biological Control Program

The program was established in 1998 to prevent, limit, clean up, or remediate the impact to the environment, or human health and safety, from contaminated or undesirable plants or animals. The program is responsible for integration of (1) expanded radiological surveillance, (2) control of plants and animals, (3) cleanup of legacy and new contamination, and (4) restoration of sites affected by radioactive contamination spread by plants and animals. During 2002, there were no incidents of offsite contamination from plants or animals, and all reported cases of new contamination on the site were cleaned up or scheduled for cleanup. Flying insects were routinely monitored on Hanford and one contaminated housefly was captured in an inactive liquid waste transfer facility in the 200-West Area. The source of the contamination was identified and sealed. There were 10 contaminated animals detected, the same number as in 2001.

There are ten plant species targeted by the Noxious Weed Control Program: yellow starthistle, rush skeletonweed, medusahead, babysbreath, dalmatian toadflax, spotted knapweed, diffuse knapweed, Russian knapweed, saltcedar, and purple loosestrife. They are controlled by chemical or physical means or by introducing natural insect predators.

## Community Operated Surveillance Program

This program was initiated in 1990 to increase the public's involvement in and awareness of Hanford's surveillance program. During 2002, nine radiological air sampling stations were operated at selected locations around the site perimeter. Four of the stations are operated by area teachers at Basin City, Richland, and Toppenish, Washington, and at Edwin Markham Elementary School in Franklin County.

## Quality Assurance

Comprehensive quality assurance programs, which include various quality control practices and methods to verify data, are maintained for data quality. The programs are implemented through quality assurance plans designed to meet requirements of the American National Standards Institute/American Society of Mechanical Engineers and DOE Orders. Quality assurance plans are maintained for all activities, and auditors verify conformance. Quality control methods include, but are not limited to, replicate sampling and analysis, analysis of field blanks and blind reference standards, participation in interlaboratory cross-check studies, and splitting samples with other laboratories.

Sample collection and laboratory analyses are conducted using documented and approved procedures. When sample results are received, they are screened for anomalous values by comparing them to recent results and historical data. Analytical laboratory performance on the submitted double blind samples, the EPA Laboratory Intercomparison Studies Program, and the national DOE Quality Assessment Program indicated that laboratory performance was adequate overall, was excellent in some areas, and needed improvement in others.